Synthesis of Nanomaterials by Laser Ablation for Water Applications

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Bi-metallic core-shell nanoparticles were prepared using an environmentally friendly and economic way. AuCoreAgShell and AgCoreAuShell nanoparticles were developed using Laser ablation in liquid technique with Nd-YAG laser at 1064nm wavelength, laser fluence 55 J/cm2 in (DDW). The prepared bimetallic nanoparticles' morphological and structural properties were characterized using TEM, DLS, and UV–Vis spectrophotometry. Furthermore, the core-shell mechanism of formation has also been represented. The prepared Ag NPs and Au NPs have a spherical shape with an average particle size in the range of 8 to 10nm and 10 to 15nm respectively.. Moreover, the AuCoreAgShell and AgCoreAuShell forms were spherical and oval shaped. The plasmon band of core–shell NPs has been red shifted with increasing the thickness of the deposited gold shell while, it turned blue shifted with increasing the deposited thickness of sliver shell. To get a better understanding of the coating conditions, and to confirm the core-shell configuration, high-resolution electron microscopy HRTEM images were used. All the prepared nanoparticles in this study showed Bragg's characteristic reflection plane of fcc structure. AgCoreAuShel more stable than AuCoreAgShell because the gold has higher negativity than silver.

Metal and bimetal nanoparticles are used to remove Methylene Blue as a toxic dye from an aqueous solution under sunlight irradiation. A comparative study was performed on the photocatalytic degradation performance of silver and Agcore Aushell. The degradation efficiency of Ag NPs and Agcore Aushell's in 70 min were 88.8% and 95.4% respectively. There is an improvement in the photocatalytic degradation performance of Agcore Aushell of silver nanoparticles. Consequently, the present study opens a new era for metal and bimetal nanostructures preparation. Furthermore, the high removal efficiency of core-shell samples prepared with a few milligrams as a photocatalyst has opened a promising application for removing toxic dyes such as Methylene Blue removal from industrial effluents. As far as the authors are aware, such photocatalysts have been rarely studied in the past.

Biography

Hisham M imam has obtained his Doctor of Philosophy (PhD) in nanotoxicology Currently working on exosomes derived from human induced Pluripotent Stem Cells for drug delivery in epilepsy..

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